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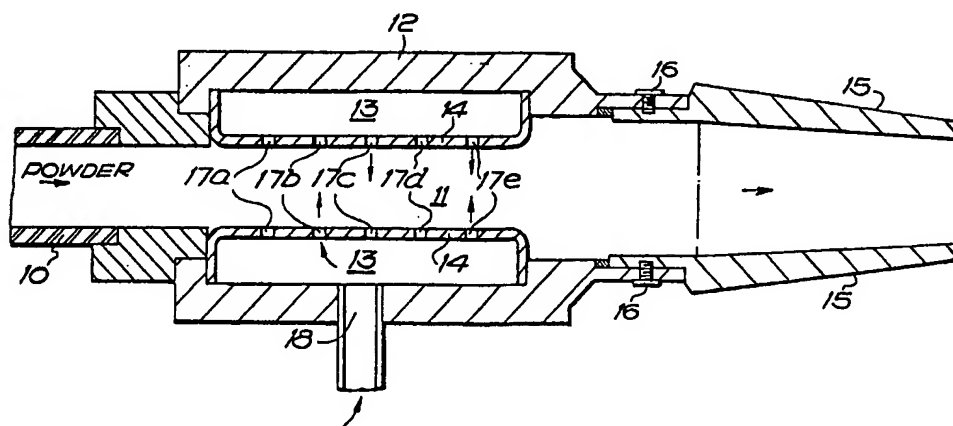
(71) Applicant
Edwin Frank Copper of
Tunnel Research &
Development Limited,

109 Park View, Whiteley
Bay, Tyne & Wear
(72) Inventor
Edwin Frank Cooper
(74) Agent
W. Reid Sharp & Co.

(54) Nozzles

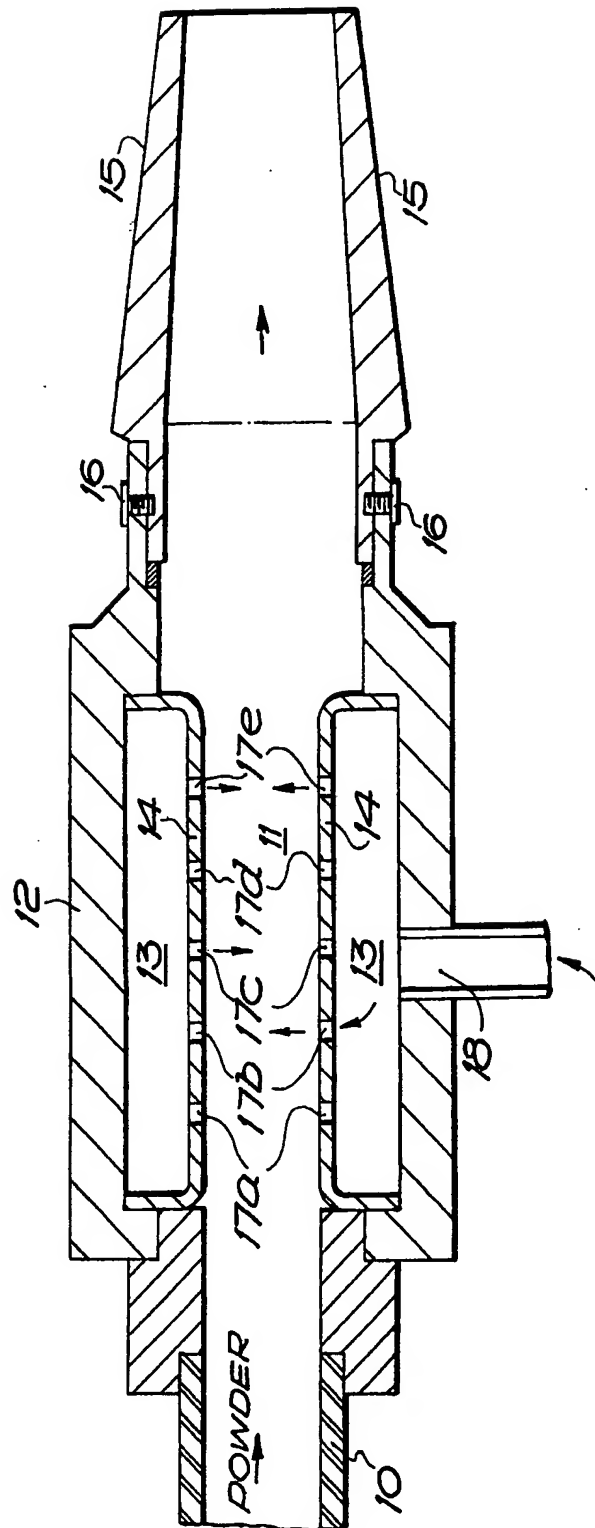
(57) A nozzle for spraying cementitious material has a mixing chamber 11 which receives powder from a hose 10, and a coaxial compartment 13 separated by a sleeve 14 from the

mixing chamber. The compartment receives water under pressure which passes through apertures arranged in circumferential series 17a—17e in the sleeve, the apertures in each series being angularly off-set from those in the adjacent series. This produces a plurality of radial water jets in the mixing chamber 11 to secure substantially uniform wetting and hydration of powder entering the chamber. The nozzle is to be primarily used in spraying concrete to build up structures and linings e.g. in tunnels.



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SPECIFICATION

Improved Hydro Powder Mixer Nozzle

This invention relates to a nozzle for spraying concrete, for example in building up wall surfaces and structural parts on a supporting structure, or on a former which is later to be removed, and applicable in, for example lining tunnels and excavations.

In spraying concrete mixtures, the cement powder must be mixed at some stage with water. Because of a tendency for the wetted cement to begin gelling quickly, it is usually the practice to add the water to the cement powder at the last possible moment, e.g. in or immediately before the nozzle.

It is found, however, for example with coaxial jets or separate feeds converging on a common nozzle, that the wetting of the cement powder is uneven, some parts being satisfactorily wetted, but others being left substantially dry. This is, of course, disadvantageous as a structure of several sprayed layers of concrete is seriously weakened if parts of the concrete have not gelled due to remaining dry.

An object of the present invention is to overcome the problem of uneven wetting of sprayed concrete.

Accordingly, the invention provides a nozzle for spraying concrete having a mixing chamber which receives dry concrete powder through a supply hose, and water into a coaxial compartment defined by a cylindrical sleeve in the mixing chamber, the sleeve having one or more circular series of apertures extending around the sleeve and communicating between the mixing chamber and the compartment.

Preferably each series of apertures comprises from 5 to 6 apertures, and each successive series has its apertures angularly staggered with respect to the previous series, so that substantially the entire cross-section of the powder stream can be wetted.

In the accompanying drawings, wherein Fig. 1 is a longitudinal cross-sectional view of a nozzle according to the invention, and Fig. 2 a cross-section on line II—II of Fig. 1, a preferred embodiment of the invention is illustrated by way of example.

As shown in the drawings, the nozzle is fed with powdered cement mix through a hose 10, the mix being blown in its dry state. The powder enters a mixing chamber 11 contained in a housing 12 and separated from a coaxial compartment 13 by a spool 14. A nozzle 15, which may be replaceable for desired spraying effects, is connected to the outlet end of housing 12 by grub screws 16.

The spool 14 is provided with five series of apertures 17a to 17e, each comprising 16 apertures arranged on a circumference of the spool 14. In accordance with a preferred feature of the invention, the apertures of each successive series 17a—17e are angularly off-set with respect to those in the preceding series, and the

amount of the off-set between one series and the next is $1/5$ the angle between adjacent apertures in any series, the apertures being equally spaced. That is, the apertures in each series are $22^{\circ}5'$ apart, and the off-set between the apertures in successive series is $4^{\circ}5'$. This helps to maximise the wetting effect of water passing through the apertures into the mixing chamber 11.

Water under pressure enters the compartment 13 via port 18, and is forced through the apertures 17a—17e forming a plurality of jets playing radially of the mixing chamber 11. The off-set of successive series of apertures ensures that these jets wet the whole cross-section of the flow of cement mix powder substantially evenly, thereby avoiding pockets and 'bubbles' of unwetted powder.

The described embodiment enables thorough hydration to take place at the last possible moment, so that clogging of the nozzle by gelling cement is reduced.

The water may be doped with an accelerator such as sodium silicate, so that the cement sets quickly after spraying whereby collapse of wet cement is avoided, and in spraying a multi-layer coating, a further layer can be sprayed without undue delay.

Claims

1. A nozzle for spraying a cementitious mixture having a mixing chamber to receive dry cementitious powder through a supply hose, and water into a coaxial compartment defined by a cylindrical sleeve in the mixing chamber the sleeve having one or more circular series of apertures extending around the sleeve and communicating between the mixing chamber and the compartment.

2. A nozzle according to Claim 1, wherein the apertures of each successive series are angularly off-set with regard to those of an adjacent series.

3. A nozzle for spraying a cementitious mixture substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

New Claims or Amendments to Claims filed on 12.4.79.

Superseded Claims 1—3.

New Claims

1. A nozzle for spraying a cementitious mixture having a mixing chamber to receive dry cementitious powder through a supply hose, and water into a coaxial compartment defined by a cylindrical sleeve in the mixing chamber, the sleeve having two or more circular series of apertures extending around the sleeve, the apertures of which are angularly offset with respect to each other, and communicate between the mixing chamber and the compartment.

2. A nozzle according to claim 1 wherein four successive series of apertures are provided, the apertures of which are angularly offset with respect to those of each adjacent series.

3. A nozzle according to claim 1 or 2 wherein the apertures of each succeeding series are angularly offset with respect to those of the preceding series by from 3° to 10°.

5 4. A nozzle according to claim 3 wherein said apertures in each successive series are offset by

angle of approximately 5° from those in each preceding series.

10 5. A nozzle for spraying a cementitious mixture substantially as hereinbefore described with reference and as illustrated in the accompanying drawings.